The Province of Alberta

IN THE MATTER OF "THE NATURAL GAS UTILITIES ACT"

—and—

IN THE MATTER OF an Enquiry into Scheme to be adopted for Gathering, Processing and Transmission of Natural Gas in Turner Valley

G. M. BLACKSTOCK, Esq., K.C., *Chairman*

Dr. E. H. BOOMER, F.C.I.C., *Commissioner*

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THE CHAIRMAN: All right, gentlemen.

MR. BLANCHARD: Mr. Chairman I would just like to mention the fact that I heard it suggested that there was a possibility the Board would sit until 12 today and then from 2 to 4 this afternoon in an endeavour to try to have this chapter finished before Easter and I thought it might be mentioned now whether that will interfere with Counsels' engagements.

THE CHAIRMAN: I was going to touch on that this morning, Mr. Blanchard. As you say, we are anxious to finish this chapter of the Inquiry by next Wednesday afternoon and one reason for that quite frankly is to permit Dr. Katz to keep another appointment many hundreds of miles from here, and I was going to suggest that we sit from 9.30 until 12 and from 2 until 4 each day until next Wednesday.

MR. CHAMBERS: That would be a week from tomorrow.

THE CHAIRMAN: A week from tomorrow but I find that Dr. Boomer cannot sit this afternoon so that our present arrangement must go on from now until 1 o'clock to-day but tomorrow and the three days of next week, subject to what counsel may say and subject to their appointments, I would like to sit each morning from 9.30 until 12 and from 2 until 4 in the afternoon. I do not propose to go on with that for the balance of the hearing, I think perhaps that would be for too long a time in view of the nature of the evidence we are dealing with but subject to the convenience of Counsel if that can be done I would like to adopt that rule for the present time.

MR. STEER: It is quite agreeable to me, Sir..

MR. CHAMBERS: It is agreeable to us.

THE CHAIRMAN: Then for tomorrow, from 9.30 until 12 and 2 to 4 and the same rule will apply to Monday, Tuesday and Wednesday of next week.

MR. HARVIE: Is it suggested that we sit Easter Monday or not?

THE CHAIRMAN: I have been waiting to hear from you gentlemen on that. Quite frankly I do not want to sit myself.

MR. HARVIE: Nor do I.

THE CHAIRMAN: But I am willing to subrogate my own wishes to your wishes. What do you say, Mr.Fenerty.

MR. FENERTY: Personally I would prefer not to sit on Monday. I think that for the length of time that this inquiry is going to last that one day will not make much difference.

THE CHAIRMAN: Then should we sit on Thursday of Easter week, do you want to sit on Thursday of that week, that would be Tuesday, Wednesday and Thursday.

MR. CHAMBERS: If it is agreeable with the Board, that is all right with me.

THE CHAIRMAN: All right, we will not sit on Easter Monday but we will sit on Tuesday, Wednesday and Thursday of that week.

MR. CHAMBERS: Just arising out of what you have said, if by any chance we should finish on the reserves matter by Tuesday night of next week or Wednesday at noon, does the Board intend to go on with the next item of business? I am just inquiring so as to have our witnesses and material ready.

THE CHAIRMAN: The next is "The present and estimated future market demands".

MR. CHAMBERS: So far as we are concerned we are quite prepared to go on with that.

THE CHAIRMAN: All right we will do that then.

MR. BLANCHARD: Mr. Chairman, if you sit on Thursday of Easter week --

THE CHAIRMAN: Yes.

MR. BLANCHARD: I will not be able to be here, at least I think I will not at the present time but I think at that time you will be going on with a topic that I might be able to miss for that one day.

THE CHAIRMAN: Well we will consider that when we come to it, Mr. Blanchard, because we have to accommodate all Counsel in the matter. We cannot ask you to give up your whole time.

MR. BLANCHARD: Yes, but I do not want to upset everyone else. It may be that I will be able to arrange my Court sittings.

Then there is one other matter, and I do not know whether I should gaze so very far into the future, Sir, except that it might be kept in mind by everyone else, I am informed by the Honorable The Chief Justice who telephoned me yesterday afternoon to tell me that the week of June 4, - I say that is gazing far into the future of course and we may be all through with this long before that at the rate we are going, - but the Supreme Court Criminal will be sitting, The Supreme Court Civil and Appellate Division during that week so that it looks as if every court room and all the court reporters

will be tied up for the whole of that week. I just mention it at the moment because the Chief Justice spoke to me about it.

THE CHAIRMAN: Well we will have to keep all these things in mind and try to arrange everything to suit the convenience of everyone.

RALPH E. DAVIS having been recalled cross-examination by Mr. Chambers continued -

Q Mr. Davis, merely for the purposes of the record and to correlate your estimates with the others, I handed to you last night my understanding of a break down of your 355 billion figure for dry gas as at January 1, 1945; now will you check those figures as we go along?

A Just a moment Sir, yes, I have the sheet right here .

Q Now it is my understanding that according to your evidence, that 355 billion will be provided by, - first of all, the B.A. area: The crude gas from 1945 to 1952 will be 21.4 billion, is that right?

A Yes.

Q And the gas cap in the B.A.area would provide 18.9 billion?

A Yes.

Q Making a total from the B.A. area of 40.3 billion?

A That is correct.

Q And then the Mayland or G.O.P. area; the crude gas from 1945 to 1952 will be 12.1 billion?

A Yes.

Q And the gas cap in that area would provide 23.8 billion?

A Yes.

Q Which makes the total from Mayland or G.O.P. area of 35.9 billion?

A

A That is right.

Q And then turning to the Madison system: The crude gas from 1945 to 1952 would be 76.8 billion?

A Yes.

Q And of that the North crude would be 56 and the South crude 20.8?

A Yes.

MR. BLANCHARD: I did not get the last figure?

MR. CHAMBERS: I am breaking down that figure of 76.8, the crude gas from the Madison area, - in the North area it would be 56 and in the South area 20.8.

Q MR. CHAMBERS: Then in the Royalite gas cap would be 202 billion?

A Yes.

Q Or the total of the Madison area of 278,8 billion?

A That is right.

Q And assuming that there were 16 billion of dry gas want to the market in 1944, for the comparable dry gas reserves available for the market on the first of January 1944, we would add 16 billion to your 355 billion in order to get the comparable figure for January 1, 1944:

A That is right.

Q Now Mr. Davis --

MR. HARVIE: Mr. Chambers just to get that clarified, does that correlate the areas in the same way as the other witness Dr. Katz has, as to the B.A. and G.O.P., rather than the North and South as Mr. Davis has and the Madison area.

MR. CHAMBERS: Yes that is my understanding

of it.

MR. HARVIE: These are given as the same comparable figures.

MR. CHAMBERS: That is the purpose of my preparing this.

MR. HARVIE: That is right.

Q MR. CHAMBERS: Mr. Davis, would you turn for a moment to page 45 of your exhibit 38 which is a graph of the rock pressure.

(Go to page 879.)

Ralph E. Davis,
Cross-Exam. by Mr. Chambers.

And turning to the graph on the right hand side of the page which I understand is the graph of the rock pressures completed against time ?

A That is right.

Q Yesterday I understood you to say that the break in that graph about 1937 or 1938 in the rock pressure vs the time graph was probably due to an influx into the gas cap from the oil reservoir immediately after the discovery of the oil field ?

A I recall expressing my idea and I believe more to this point of view, that the oil field development began about 1936 and had become more intensified by 1937 and 1938, gas was being released in the oil field portion of the reservoir that we know and the change in the slope of this graph indicates to my mind the probability that that turn in the direction was influenced by an accretion of gas from the oil reservoir. I did not say it positively must have been that.

Q Well I am just going to make this to you as a suggestion, that it may be more the reason than the one you have given. Whether the change in that curve is not more likely to have been caused by the voluntary reduction in the gas cap withdrawals from the wells connected to the Royalite No. 1 plant in 1937 which was followed by the introduction of Conservation Board orders restricting the use of the gas cap in the fall of 1938 ?

A I think that equalization of pressure in the gas cap reservoir would tend to give me the same change in this graph that appears in it regardless of accretion of gas from the oil field. In other words I agree with you

that the restricted flow of gas from the gas cap would have a tendency to permit equalization of pressures and that equalization of pressures would bring about a rise in the pressure of the low pressure areas reflected therefore in the figures indicated here as the arithmetic average and also in the weighted average. I agree with you that might well have been a major factor.

Q Thank you very much.

CROSS-EXAMINED BY MR. McDONALD:

Q Mr. Davis I think it is on page 4 of your report. You refer to, in the middle of the page,"initial rock pressure of field was never gauged but is believed to have been approximately 2,050 pounds per square inch, (Top hole pressure)". I think you are referring to the gas cap wells ?

A Yes I am.

Q Could you give us the approximate equivalent in bottom hole pressure for that 2,050 pounds ?

A I have not a table of weights of gas pressures at my hand.

MR. WEGE: 2,450 pounds absolute.

A It would be about 2,450 pounds absolute.

Q MR. McDONALD: And my figure was 2,460 pounds absolute, so about 2,450 is about right ?

A Well Mr. Wege has the details and working papers with him and he says about 2,450.

MR. BLANCHARD: I have 2,470.

MR. HARVIE: What is the 2,450 at ?

MR. WEGE: 5,100.

MR. McDONALD: My calculation is 2,460 pounds absolute. It makes 1,100 and your calculation 2,450.

At what elevation ?

MR. WEGE: I just do not know but at 5,100 foot depth.

Q MR. McDONALD: That is assuming 4,000 average elevation ?

A Approximately, yes.

Q Now returning to page 45, Mr. Davis, the left hand side of the sheet. You have the graph of the average rock pressure against cumulative production. You have drawn a similar graph using the bottom hole pressure or the weighted average bottom hole pressure. Would you have a different result in the cumulative production ?

A Not in the accumulative production, the accumulative production relates to the amount of gas withdrawn. Had I plotted that cumulative production against the bottom hole pressures as determined from time to time, it would have started from a point at the left of about 2,450 pounds and it would have declined down the page as we proceed to the right, somewhat more steeply than the upper of these two graphs that I have shown. Eventually conceiving it to proceed to complete exhaustion of the reservoir then these lines would meet. That is to say, bottom hole pressure would be with complete exhaustion so nearly the same as top of well pressure that the lines would appear to meet on the paper.

Q Now in answer to Mr. Chambers yesterday, Mr. Davis, page 868 of the record, you were referring to the intake pressure of the Madison and part of your answer is,

"I thought that they might bring that pressure down at the intake of their main station to about 100 pounds, meaning that the pressure all through the

field would range from 140 to 150 or 175 pounds."

Now were you referring there to top hole pressures or to bottom hole pressures ?

A I was referring to pressures of the surface.

Q On the surface ?

A Yes, I think that I said that the pressures through the field would then range from 100 up to such pressures as 140 or 150 or maybe 175. Not ranging between 140 and 175, but from 100 up. If intake pressure at the Madison plant were to be 100 pounds intake gauge reading, then the pressures from that point into the field would be gradually higher back towards the more distant wells and might at any nearby well be 110 pounds or 120; whereas at a distant well it might be 175.

Q Now Mr. Davis at page 17 of your report in the last paragraph. You are referring to the upper tiers of wells near the gas cap. And then you said,

"Whether or not these upper wells will have a column of fluid of such height that the gas, under the lowered pressures that will exist at that time, will not lift the column of fluid, I do not know."

Now have you any statement of that kind to make in regard to the gas cap wells ?

A Well I am informed that some of the gas cap wells have even under conditions that have existed in the field and recent time periods for the last few years tended to load up with fluid which is blown from time to time enabling the well to continue its gas production. That has been my understanding of that matter and it is of course not surprising that it should be so. Gas wells in fields

do tend to load up with fluid if there be a liquid fluid present in the strata tending to make intermittent the gas production. Sometimes it is a practice to put syphons in the wells so that the valve on the outer string can be closed and the pressure built up to a point so that the pressure is sufficient to cause a flow through the smaller tubing, cleaning the well, and thereafter produce gas until it loads up again. That happens with various fluids, water being one.

Q Have you made any detailed study of the gas cap wells with regard to that point ?

A No I have not.

Q You are speaking generally ?

A I am speaking generally sir.

Q And the liquid loads of gas cap wells will not affect your estimate of the reserves ?

A I did not get that question.

Q The liquid load of these gas cap wells will not affect your estimate of reserves, that is your total ?

A I feel that the estimate made is a quantity of gas that can be recovered even with the difficulties of production that may be encountered, that I have an allowance in my estimate. The estimate being as you have learned the judgment estimate. The cushion against which gas too difficult to obtain on account of the increasing cost can be left in the reservoir and be a quantity in excess of my 300 billion.

Q Then if you turn to Page 20, Mr. Davis, in the second paragraph, you mention "The wells considered in the gas cap area have a total assigned acreage of some 5150 acres, whereas the entire gas cap covered some 10,000 acres. Much of the unassigned acreage lies in the area of the gas cap tributary to the Madison gathering system." Now I am not just sure whether in making your estimate you have referred to the gas as being recoverable, in the gas cap as being recoverable from the 5150 acres or is it to be recovered from the entire 10,000 acres?

A Well, of course, I would agree with you that there is no underground boundary known to exist surrounding the 5000 acres. The gas must penetrate slowly from the undrilled area toward the drilled areas, excepting in certain possible places where faulting would interrupt that flow, cause it not to flow in a given direction; but taken as a whole my answer would be that I am considering the entire gas cap area, the 10,000 acre area as the one containing the remaining recoverable 300 billion cubic feet, and not merely the 5150 acres. In other words, I feel that the gas which has been produced from the field has come largely from the 5150 acres but not entirely. A considerable part has come from the other acreage and that same thing will continue in the future.

Q Now as I understand it, in arriving at your weighted average pressure you use the assigned acreage as your weighting element?

A No, I do not.

Q You do not?

A No.

Q Will you just explain it?

A I say here in this paragraph that the wells in the gas cap area have a total assigned acreage of 5150 acres. Now in weighting pressures to determine what we call a weighted average pressure, we weighted for acreage, not for sand thickness nor for porosity. We do not know enough about those two factors. But we weighted for acreage so that my plotting on a sheet of paper, and I have a map, I believe, here in the room, we plot on the map the pressure of each well in, let us say, the year 1944, that being a typical year. Then having plotted out pressures, lines of equal pressure are drawn on the map, and having drawn those lines we can determine most easily the number of acres in each pressure zone. And we might find in one pressure zone, say 1200 acres; in another pressure zone 240 acres. The pressure assigned to the first of these two zones would be the pressure of its upper and lower limits. That same statement also applies to the second pressure zone. Now in finding the weighted average we would give the first of these two zones four times the weight, because it is four times as large in area. I would like to have that map here. You are not familiar with this map are you?

Q No.

A It will be produced and placed on the record if the Board desires. Incidentally there is a similar map in one of the Madison filings. It is already before the Board.

Q Well would you just put it in. I just went to refer to

it later on if it is on the record.

A I will let you see this, of course, and if it is necessary we can make copies. But I will now say that Mr. S. E.Slipper, who was the chief geologist for the Canadian Western Company for a great many years, provided maps of this nature of Turner Valley during the years 1931 to 1939 inclusive, and again this map in 1944. Mr.Slipper prepared this map and each of the others that have been used by me. There are some four years in which no such pressure maps was prepared . And you will note that on the graph on page 45 no points are shown for the years 1940 to 1943 inclusive.

Q Could you leave that map with us, Mr. Davis?

A Yes.

Q And mark it aw an exhibit?

A Do you want it filed as a single exhibit? Is that the wish?

THE CHAIRMAN: Exhibit 39. How would you describe that? As a pressure contour map?

A Weighted average pressure contour map, I believe. Let me see what the title on it is, that would be the best way. Well, this is a map showing the 24 hour closed pressures of wells in the gas cap area of the Turner Valley field for the year 1944, and with lines of equal pressure drawn on the map, thus indicating areas of different pressures.

MAP IN QUESTION THEN MARKED AS EXHIBIT 39.

MR. STEER: Was the deal that the witness made with the Board that we were to have that map back?

THE CHAIRMAN: You are to file a copy.

Q MR. McDONALD: Mr.Davis, in your reserves that you estimate from the gas cap, did you take into account the further drilling of gas cap wells?

A I feel that further drilling of gas cap wells is likely to be needed and necessary. If you want to take that gas out in a long enough time period , you might get by without additional wells, but in the event that peak loads must be met in a much more limited time period than just eventually, additional gas cap wells are likely to be needed. That is my judgment. And that does not affect my estimate of reserves. It would affect my estimate of the rate at which reserves will be withdrawn. Were I to limit myself to pressure wells I would say that the reserves would be taken out over a longer period of time than would be the case if we had the wells needed to meet the annual load including the annual peak load.

Q Now some of the other parties have estimated six wells, would you have that number in mind?

A Well I have not concentrated on that point at all. It strikes me as just a matter of judgment that six is a minimum number. I would expect it might be more than six. But other things might be done to promote the withdrawal of gas. Something may be done to make the present wells give up gas more easily, when the day comes that more gas is needed.

Q Will you turn to page 21 of your report, in the total of that page, the last two items before your total, "Wells connected toG.O.P. but with pressures too low

to deliver 50,779. Wells which will probably not be connected to any system 182,411." That refers to the first six months' operation of 1944. Have you in your working papers the names of the wells that you referred to there?

A I think we have. Are they here, Mr. Wege? We took into account certain wells and we had it in our working papers.

Q Well if they are not handy, you can make them available?

A That can easily be done, yes. You mean tomorrow or later in the morning, what did you wish?

Q Locate it during the day.

A Mr.Wege will arrange that for you.

Q On page 22 you referred to wells in the South field in the same category - no, in the North field in the same category. You refer to a study of wells which will probably not be connected and shows that they produced 165,718 M cubic feet. Would you give us the names of those wells at the same time?

A Yes, sir. You have those have you, Mr. Wege?

MR.WEGE: Yes,

A WITNESS: Yes, that will be given to you.

Q If you have them now you could read them into the record.

Q Mr. Davis, in checking up the amount of gas that may not be recovered in the respective years, would you give consideration to the fact that the pressure, suction pressure in the North end is not as low as that in the South end?

A My picture of the field is that the wells in the South end having been producing and having reached a lower operating pressure that it would not be necessary to have as low a present gathering system pressure in the North end.

Q But you would expect as time goes on and the pressure in the North end will become on a par with that in the South end and you have to make some allowances in respect to your 2.71 per cent and 5 per cent.

A In arriving at the figure of 5 per cent that is my selected judgment.

Q Now turning to page 27 of that report, which refers to tables on pages 39 and 43, the bottom of the page. You refer to two methods of production from the B.A. and G.O.P. gas caps.

A Yes.

Q One monthly and one annually.

A That is right.

Q Now dealing with the monthly allowable basis on that page 39 and referring to the year 1945 you have an item "Gas available for storage 5,699 million cubic feet." Can you tell me, Mr. Davis, how that item is made up as between storage in the North end and storage in the South end?

A I believe that is arrived at by noting that the amount

of gas available in each month is assumed to be equal, I mean during that one year and the amount of 2,075 billion cubic feet for the month of January, February, March, etc. across the page, that is for the field as a whole exclusive of the Royalite gas cap which is shut in. Now the load requirements are tabulated under first, seasonal markets which vary month to month. In January the figure is 1,651 million cubic feet and runs down to 330 million in July. Then non-seasonal markets which are essentially a constant figure, drilling fuel requirements which for the year are taken at an equal monthly amount. There we have the summation of these market requirements, the first month you will note showing a total requirement of 2,385 million cubic feet and the total gas available is 2,075 million cubic feet. Therefore a shortage exists of 310 million cubic feet. When that calculation is run through the 12 months across the page and then back to the left we then see the requirements there for the same months of January, February and December are 598 million and that the gas available for storage being the excess production of the warmer months over the market requirements, totals 5, 699 million and the total gas sent to the market is 19,799 million so that these figures in that year are compared to the total production of 24,900,000 and the production of the gas cap, the Royalite Gas cap, 598 million. You ask me how that gas available for storage is found in the North and the South portions of the field. I did not find it that way. I have not

ever tried to carry it back to that starting point that you request, but I show you how it is brought forth and how the figure is arrived at.

Q Yes. You did not calculate it on a sharing-position basis?

A No, I did not. I gave, as you recall, the gas caps controlled by Madison and G. O. P. the privilege of producing whereas the present gas cap was given the privilege of producing when production was necessary for market.

Q Yes. To that extent, you did go on a sharing-position basis?

A Well, I have a feeling that especially during the remaining period of the war these gasoline plants are considered very essential in full operation and they need the gas that is available to them. So that the Board would be inclined to order that these gas cap wells available to these two plants be continued in full operation. That was my thought. What will happen after the war, if anything at all happens, I cannot tell you in regard to this particular matter.

Q I take it from your conclusion on page 40, referring to the same table, that after 1952 your estimate is that there will not be any gas available for storage.

A Well I would say that after 1952 there will be no need to store gas. There will be no need to store gas. Gas could be withdrawn from the gas cap reservoir and stripped of its gasoline and could then be put back into the reservoir. I would not know why that would be ordered or permitted. There would be no war demand we believe.

Q Have you given consideration, Mr. Davis, to the circumstances which would determine in this field when stored gas would be withdrawn for market purposes?

A Do you mean the physical return of the gas?

Q Yes, the physical reproduction of the gas.

A The actual return of an individual methane particle?

Q No, what I have in mind is this. Under a proposal under which the B.A. area is going to be re-pressured, the gas could be re-pressured under a pooling arrangement and under one of the proposals suggested for the North end, the gas is re-pressured in a storage area in itself. Now under what marketing conditions would you judge that stored gas should be reproduced and fed into the market?

A Well I doubt that I have given that as much consideration as I should give it to answer your question. I am not wishing to avoid the question. I just am not at the moment prepared to say what I would like to be prepared to say. But in the first place, I conceive that stored gas physically beginning its return into the marketing stream fairly early, taking the place of gas that would otherwise have been in that stream had there been no stored gas. It could easily precede out of the well bore that gas that lies beneath it as a cushion let us say, just as in storage reservoirs in the States. There are a great many of them in use today. And gas is pumped into the underground storage reservoir and during the cold winter months gas is withdrawn, bringing the pressure down to some such limit, say, as 300 pounds and then during

the summer, the gas is poured back into that field until the pressure is back up as high as 500 or 600 pounds and the following winter the gas is removed again. The gas that is in that reservoir, acting as a cushion, may be largely gas that was there from the beginning and the stored gas is going in and coming out. There would be something like that, not as completely like that as it is a storage reservoir because the quantity of gas stored would be so small compared to the total quantity in the reseroir.

Q Do you know, talking from a physical aspect, how any gas produced by an input well would be produced in proportion as the re-pressured gas bears to the gas reserves that is in that well at the time the re-pressuring is taken into account, is started. That would take care of your question of your reserves and actual physical production of the gas. It is produced from the original reserve and from the re-pressured gas.

A Now there would be a portion of the excess that is original reserve and re-pressure reserve in the gas delivered in the period between 1950 and 1960 for example. There would be some of the gas which would be gas which had been stored in the reservoir and some of the gas would be gas that had been there originally.

Q Having regard to the market demands and the Brown Allowable, or any other allowable that may be in force, have you formed any opinion as to when in 1952 or earlier that re-pressured gas would actually be coming back into the market?

A I have not directed a study to the points you have brought up.

Q It might be shortly after 1952?

A Some of that gas would be coming back particularly after 1952, if the wells are drawn on from which that gas was stored. If a storage well were reserved to be used as a storage well then that gas might not come back for some considerable time after 1952, that is, subject to it flowing to another well.

Q I am not interested in that at the moment?

A You are assuming keeping an input well for the summer to be used as an output well for the winter?

Q Yes?

A Then if you are assuming that, then the gas put in there will form a part of the outgoing stream when the well is open.

MR. MCDONALD: Thank you.

.....

CROSS-EXAMINATION BY MR. HARVIE

Q There is just one point, Mr. Davis, that I think we can usefully have you express your views on, I think you have covered it maybe in a general way but it is more to have it on the record so that we can compare it with the evidence of others, - Dr. Katz I think in his evidence stated that the Brown Alloweble Plan would possibly carry out until around 1948 or 1949 and at that time they would have to take a look at the situation and possibly have to make some change in that Plan, such as increasing the 25 barrel allowable; have you any views on that or do you think that the Brown Plan as it is now used will carry on from 1952?

A Oh, I have never endeavoured to study that point with care but I do have a thought with regard to it and that thought is this that the Brown Plan is now in effect and the war demand in also in effect and then even though it might be concluded after some study that it would be desirable to reduce the 25 barrel per acre per day allotment on account of the critical need for oil at the time, it would not be considered best in the public interest to change the allowable. Now if the war passes, when it passes, it might be and I think it will be time to reconsider whether or not the specific allowable which is now in effect will be the best for all concerned. I do not know what the conclusion will be but I think it would be well to again study the problem.

Q In other words you consider the Brown Plan should be made flexible to meet the situation when the conditions are known?

A I think the Brown plan should be made as flexible a plan as the Texas Railway Commission made a flexible plan in the operation of the conditions under which operations are conducted in the East Texas Oil field. If after a given period of months the result of the allowable production shows a heightening drop in the bottom-hole pressures of the field, the commission affected as it was by the war situation, ordered a reduction in the allowable and when that reduction had obtained a correction of the trouble and war demands then made it essential to increase the production if possible, they have permitted an increase; in other words during the past two years the Railway Commission of Texas has altered the allowable in wells in the East Texas fields at least several times. There

is no reason why an allowable once fixed should remain fixed eternally and forever. I think the matter should receive a frequent consideration.

MR. HARVIE: Thank you.

MR. STEER: I have now that list of wells which my friend Mr. McDonald asked for, if he desires to put it in.

Q MR. MCDONALD: Maybe, Mr. Davis, if you would read this into the record?

A The wells in the South field that we assumed in our study would not be connected; The Anglo Canadian 8, The A. P. Royalties 1, The B. A. Brown 1, The Brown 6, The National 2, Okalta 12 and The Royalite Wells 34, 54 and 57.

The wells in the South field that were connected at the time of our study to the G.O.P. system but that were not delivering due to low Seperator Pressure included: Allied, East Crest 4 and Kamalta.

In the North field the wells which we assumed would not be connected included: Anglo-Phillips , Home-Millarville 9 and 11, Mayland 1, National Vulcan 1, North Glonmel 1, Royalite 56 and 60 and Royalite-Lowery.

MR. MCDONALD: Thank you

MR. WEGE: There is one on there, it is spelled "Maryland", it should be "Mayland".

THE WITNESS: Where I said "Maryland" please make that"Mayland" .

CROSS-EXAMINATION BY MR. BLANCHARD

Q On what information, Mr. Davis, did you base your original top-hole pressures in this district?

A The figures which I have mentioned as 2,050 pounds?

Q Yes, or 2,560 or whatever it is?

A Well you will recall I believe that I made no special use of that pressure. It is a figure that was arrived at back in the early years when new wells drilled into the reservoir in what seemed to be nearly virgin territory, gave top-hole well pressures ranging up to 1900 to 2000 pounds. I do not recall what wells they were but this work was back in, oh I think in 1931, was that the period.

Q You referred to your old data I suppose as to top-hole pressures?

A In that old work we came to a tentative conclusion that the top-hole, the wells initial top-hole pressure was about 2,050 pounds and never found nor had any way of revising it to my knowledge.

Q And that would represent the reservoir pressure at that time minus the weight of the column of gas?

A That is right.

Q That is right, it would be the true reservoir pressure of your initial wells; now then as I understand it, as you produce these gas cap wells at a high rate of production the gauge pressure does not reflect the true reservoir pressure during the period of high production; I think you said a few minutes ago that your curve, that that might account for flattening of your curve?

A Yes, that the wells might not come back to their maximum pressures in either 15 minutes nor necessarily after 24 hours nor possibly in a month.

Q Where they have been produced to their total capacity?

A Depending upon how long the rate of flow has been continued, how great it has been and of course on the permeability of the sand.

Q And the area?

A Yes. I know of wells, we have had experiences in Pennsylvania with closed pressures taken after several months of the closing in of wells in the summer and we believed them to represent the true pressure, and with a given field where it was not required in the following winter and that happened during 1930, by the following summer we had an additional pressure of several pounds on the average well so that it takes even more than a year for wells to equalize.

Q To come into equilibrium with the reservoir pressure?

A That is true what I have said.

Q So then you say that accounts, I think you said to Mr. Chambers that accounts to a certain extent for the flattening of your curve?

A I think it has an effect, yes.

Q You said yesterday you thought migration also accounted for the flattening of the curve, the migration of gases?

A Migration from the oil area.

Q From the oil areas?

A Yes.

Q From 1936 or so on?

A I think it may well have been so and my main reason for

thinking that ,is in other oil fields,the formation of gas caps is a common occurence.

Q The formation of gas caps?

A Yes. In a field where no gas cap is present or where the the gas cap originally present is small, a gas cap that is not then drawn on by the withdrawl of gas, the only production is from the oil wells down the flank, the releasing pressure permits some portion of the gas to seep upward in the reservoir and either to form a new gas cap or to materially enlarge the original gas cap.

Q What was in that reservoir at the top before, before the gas migrated?

A In some of the cases it was a small gas cap, in others it was the oil.

Q It is not a hollow pore space ?

A No.

Q It must be filled with something?

A It was filled with either gas or oil.

Q Yes, so that your gas cap, there was gas in the gas cap at all times or else you were producing it as an oil well and it turned into a gas cap, is that what you mean?

A Well the space, the upper or crown portion of the reservoir, the pore spaces were filled either with gas or oil and gas or oil or oil and connate water . Those are the liquids commonly found in a porous body under ground.

Q And what I understand is that if an oil field is produced the higher point of the structure becomes a gas cap, is that what I understand?

A Yes, that is right and when an oil field has been produced to the extent of only 15 or 20% of its expected ultimate

production, you often get a good sized gas cap. I have known of them to form and I give it as the basis for my reason here that gas must have escaped upward in this reservoir.

(Go to Page 901)

Ralph E. Davis,
Cross-Exam. by Mr. Blanchard.

Q Well we can take this, that the recent measurement, that is the gauge measurements of bottom hole pressure, would be much closer to the reservoir pressure than the earlier pressures intervening between the first well in the field and today because these gas cap wells have not been producing to that extent lately. I mean gradual as there is less production in the gas cap your gauge pressure and your reservoir pressure become closer together, that is your curves become closer together ?

A Let us say, that you shut in all the wells in the gas cap, I would say that if there be no movement of gas into that gas cap from an outside source such as the oil zone that there would be a tendency for the wells of less than average pressure to increase in pressure, the wells of higher than average pressure to decrease in pressure. In other words a slow equalization so that you would have pressures of 1700 pounds declining; pressures of 400 pounds increasing.

Q Well what I had in mind was to ask you this, that that last gauge measurement of pressure in the gas cap would probably be nearer to the reservoir pressure than those as you go back through years in which there was the greater production ?

A After a period of rest I think that is a fair statement yes.

Q That is a fair statement ?

A Yes.

Q Your gauge curve and your true reservoir curve come closer together ?

A If they had such a thing.

Ralph E. Davis,
Cross-Exam. by Mr. Blanchard.

Q If you had both curves on your chart ?

A If you had such a thing.

Q Now you mentioned there was a very decided flattening of the curve. I think that was your answer yesterday. Due to the migration of gas into gas cap and you told us what your experience has been in that connection and you have shown your arithmetic average rock pressure and weighted average rock pressure on the curve on page 45. Now having regard to this migration of gas would you care to extrapolate those curves for the Board having regard to the migration and the flattening of the curve ?

A Well the curves on the right hand side of the page.

Q I am speaking of the other.

A You are speaking of the left ?

Q Yes.

A Well I have extrapolated them mentally for the Board, not by drawing a line on this sheet of paper.

Q I think you bring the field to extinction at about 1600 billion cubic feet, cumulative production. Am I right as to that - that would be down to atmospheric pressure ?

A That is about right.

Q That is your statement yesterday ?

A I think that is about right, yes.

Q Now having regard to that, would it be any trouble for you to extrapolate your curve from the point you have it here to the point where there is no more pressure ?

A No trouble. Did you say, do you mean to draw a line ?

Q To draw a line that reflects your opinion as to the flattening due to migration ?

A I did not choose, as you know, to place on this paper an

extrapolation of that line. You will note I did not do so.

Q Yes.

A And the reason I did not do so is because that would indicate -

Q That would indicate what ?

A That would indicate that in my mind is the thought that is the way I expect to see it go and I did not wish to carry that message half concealed and half open. That I thought it was going to go that way. I did not feel that sure about it because we have the various factors to contend with. We have an unknown accretion of gas from the oil area which if it should for any reason tend to increase in the future years as compared to recent years, it would tend to cause this curve representing cumulative production against average pressures to flatten still more. And I did not have any way of knowing what that quantity of gas may be that is fed upward into the gas reservoir or that will in the future. I do not know what it would be but it would be substantial.

Q The reason I have been going into it a little, Mr. Davis, was that you used the expression yesterday. I think I am right about this, that gas is pouring in from the oil area into the gas cap and that presented a rather disturbing picture because to a layman pouring means that there is nothing to stop it. It is moving right in. That is the reason I was rather anxious to know to what extent this migration goes. What are the limits of it. Give us some idea.

A Well I will do the best I can for you. In the first

place I will say that in my judgment the gas will be withdrawn from this field for the purposes of such markets as those supplied by Canadian Western until the average bottom hole pressure of the field is brought to something between two and three hundred pounds, somewhere in that.

Q Top hole pressure ?

A I meant to say top hole well pressure. Now if you will look again at the curve and extrapolate that curve in your mind, you will note that it crosses the two hundred pound line at 1400 billion.

Q Which curve are we speaking of ?

A The lower one on the left.

Q At 14 billion ?

A At 1400 billion and that would be 300 billion in addition to the accumulated production. Now if the average arithmetic pressure is controlling and more important than the weighted pressures and if the field be produced until the average pressure at the top of the well is reduced to 200 pounds, you will have 300 and that is the one way I arrive at the 300. The other was to assume that the weighted average pressure was more - well had more justification for its use, and by extrapolation of that line you will note that when I got to 300 pounds I would again have 300 billion feet, extrapolating it in a line about parallel with the lower extrapolation and so without giving primary weight to the arithmetic average or primary weight to the weighted curve, I really adopt a sort of medium and I assume that the

gas will be withdrawn until the pressures are somewhere in the neighbourhood of 250 pounds at the top of the well, meaning closed average pressures.

Q Well then, following this, you have said I understand, that from the last point on your lower curve on the left, that is the arithmetic average rock pressure, at which time you have got something a little under 500 pounds top hole pressure, that you then continue that curve in a straight line down to 300 pounds pressure. Is that correct ?

A Down to 100 if you like.

Q So that you are allowing for the same influence of migration all through that time, are you ?

A Yes.

Q Then we are going to have migration into the gas cap at all times until abandonment ?

A I think probably.

Q You think that is probably so ?

A Yes.

Q And at the same rate if your extrapolation is correct ?

A No because I am unable to measure the time period during which the flow of gas upwards from the oil zone may be at a given rate and then the length of the time period thereafter when it may be something less or something greater. I cannot place on this paper a graph indicating an imaginary rate for three years and some other imaginary rate for another period of years. I am looking at what I believe will be the average future condition.

Q You have just said a moment ago that you were assuming

migration into the gas cap down to the abandonment of the gas cap as a producing area ?

A But down to the abandonment of the gas cap.

Q As a producing area ?

A As a field producing for such markets as those served by Canadian Western.

Q So that means you are going to have throughout that period a higher pressure in the oil area. That follows does it not ?

A Well maybe, not constantly.

Q Well intermittently ?

A I think there might be a period when the pressure in the oil field would get down in the neighbourhood of the pressure in the gas cap.

Q When do you think that will be. Have you any idea at all ?

A Well if it is ever going to be it will be some time in the next six or seven years.

Q So that we are only going to have migration for six or seven years. Is that correct or not ? In your opinion. I am just asking you, that is all.

A No that would not follow.

Q Eh ?

A No that would not follow. I rather think that there will be migration of gas from that oil into the gas cap for about one hundred years, maybe 150 years on. I would not be a bit surprised if the village of Little Chicago, if it is still on the map 100 years from now, will have sufficient gas supply to meet its needs.

Q And your idea is most pressures in the oil area

generally will be higher than the pressures in the gas cap ?

A Well I think so.

Q You think so.

THE CHAIRMAN: Will this be a convenient point to adjourn ?

MR. BLANCHARD: Yes.

(At this time the hearing adjourned for 15 minutes)

(Go to page 908)

Q Mr. Davis, if I understand correctly your idea is that the gas cap wells can be economically produced only down to 300 pounds top hole pressure, is that correct or not?

A I say that on my judgment they will be operated down to a pressure of 300 pounds or something less than that, not for as low as 200 pounds for large scale production. I believe that gas will continue to be taken from the gas cap even when the top of the well pressure is possibly down to 25 pounds, but that will be for minor scale operations, and inconsequential as compared with say, a daily requirement of 80 million cubic feet.

Q A daily requirement of 80 million cubic feet?

A Yes.

Q That is your peak load in winter?

A That is an approximation of it.

Q Your peak load?

A Yes.

Q My information is that the peak load in winter may be from 80 to 85 million on a very cold day and for a few cold days,that is about correct is it?

A That is a fair statement of it, I think.

Q And at the present, of course, I think during this year it is predicted that there will be between 17 and 18 billion cubic feet of a market.

A I believe so, yes, sir.

Q And that becomes reduced in 1950 or '51 or '52 to something around 10 billion cubic feet, 10 billion cubic feet a year?

A Well that is an estimate that has been prepared that I have no responsibility for.

Q Oh, no, no. You are accepting the Gas Company's figures and I think that so far as I know is all you have to go on and probably as near as you can come to?

A And that is assuming too that the Ammonia Plant will not continue in operation.

Q Exactly?

A And assuming that no industry will come into the area requiring large amounts of gas that might take the place of the Ammonia Plant.

Q Well I am just wondering when you have the reduced market demand say in 1949 or 1950, what your idea is then of what the peak load requirements might be. Will they still be 80 to 85 million cubic feet a day?

A No, I would say not.

Q What would your percentage be?

A We have not made an estimate of what that peak load in that future year will be.

Q I wonder if you would care to do that for us?

A I will be glad to have it prepared this afternoon and submit it to you.

Q You see, what I have in mind is that when you get down to 10 billion cubic feet a year, you are down to an average daily production or market of about 27 million or 28 million as against 47 million at the present market demand, and that in winter you have now possibly an average in the coldest months

of 57 or 58 million, in the coldest month average, whereas in 1949 or '50 it will sink to say from 34 to 35 million cubic feet a day, and on that basis I wondered whether you could give us that.

Q Well, if you will pardon me, some of our supplementary work sheets have been put together and I do have in this compilation of work sheets a calculation of the daily peak in future years. For 1945, including the Alberta Nitrogen Plant, the Imperial Refinery, the Mayland Refinery and the Valley Pipe Line, a total peak requirement of 111 million cubic feet.

Q That is very much in excess of what you mentioned before?

A Well this is the requirement of the entire system, and you will recall that some of this gas has been taken from Turner Valley - I beg your pardon, from Bow Island. This is not confined to Turner Valley.

Q Yes, I see what you mean. All right.

A And this peak load would become in 1953 according to the estimated market requirements having been reduced, the assumption that the Nitrogen Plant will not take any gas, that no other large user of gas will have taken its place, that the Mayland Refinery would no longer operate, but that the Imperial Refinery would continue to use its present load, a peak of 82-7/10ths millions, a reduction of some 25% in round figures.

Q Do you know on how many days during the winter the peak load requirement is reached?

A No, I do not recall that.

Q Have you computed then when this entire area, that is the crude and the gas cap area, will be unable to meet the estimated peak load requirements that you have?

A That is not a matter that I can easily compute. It would require delving into certain factual matters that I do not have access to.

Q I just thought you might have followed it out?

A It is very laborious to do so, and have the facts that I would require. I did not undertake it.

Q All right. What will be the reserve after storage has been completed in Bow Island, what will be the reserve there to take care of peak load requirements?

A In Bow Island?

Q Yes?

A Well, I do not know to what extent gas is going to be put into that field in the future.

Q Well I think it is estimated that some 5 billion cubic feet will be stored.

A In addition to the gas there?

Q In addition to the gas there ?

A Yes.

Q Have you information as to what gas is there now in the Bow Island reservoir?

A Yes, we have that information I believe.

Q And recoverable?

A And recoverable.

Q Yes?

A Well there has been put into Bow Island about 12 billion cubic feet of gas, and there was a remaining reserve there of, I suppose not less than that same amount.

How much of that gas ever could be considered a recoverable reserve is problematic because it depends on what low limit of pressure you might have in mind.

Q Well, you are consulting engineer for that company, you have not that information at the present time?

A You say I do not have it?

Q Have you the information there because I do not want to put you to the trouble of looking up data if you cannot give it right at the moment. Perhaps we could leave that and let us do it at some time later, Mr.Davis, and if you could furnish us with the information we will appreciate it.

A The information that you wish is, first, how much gas is now in the field that has been put there; and, second, how much of the old reserve is still recoverable? Is that what you wish?

Q And then allowing for an additional 5 billion storage, what will be the total recoverable reserve from Bow Island and to what extent will it take up the slack for peak load purposes in the future?

A I will be glad to put some figures together for you and deliver them tomorrow.

Q Thank you very much. Then we come to this, that in your opinion the gas cap will cease to meet market requirements when the pressure has sunk to somewhere between two and three hundred, when the pressure, yes, has sunk between two and three hundred pounds top hole pressure?

A Average top hole pressure.

Q Average top hole pressure?

A Yes.

Q And that would mean, I am informed, 230 pounds to 343 pounds bottom hole pressure?

A I think that is right.

Q But you still think it would be economical to produce from that gas cap for peak load purposes supposing the Gas Company has some other field to carry part of the load?

A Yes, I would say that inasmuch as the field would have been rather completely equipped with wells, gathering systems, compressors, and a plant to take out sulphur, that it would be well to continue to use it for what it would then be worth as a partial source of gas.

Q Are you predicating your opinion as to the ability of the gas cap to meet peak load conditions on the present available compression?

A No. I have in mind that there will be additional compressors installed. I believe that there will be in order to take the pressure down to an intake pressure of let us say 100 pounds.

Q Down to 100 pounds?

A Something like that.

Q I see. Now then, I just want to leave the gas cap and discuss with you for just a moment the crude oil area and, as I understand it, your tables of oil and gas production are based on the assumption that the present allowables on the Brown plan will continue down to 1952, including 1952?

A That or approximately those allowables.

Q Approximately?

A Yes.

Q Well now, just what is meant by that?

A Well, the present allowable is 25 barrels per acre per day. I would say that anything within 20% of that figure would be approximately.

Q Within 20% of that figure, and that would be a raise of what, 5 pounds, or decline, which way?

A Well it is now 25 barrels.

Q 25 barrels I mean?

A I would say anything between twenty and thirty barrels.

Q You would say anything between 20 and 30 barrels?

A Yes, something in that range.

Q Well now, you have computed your tables, which are part of your report, you have computed your tables on that approximate assumption then. In other words, we do not know whether it is 20 pounds or 30 pounds, is that what it means, - 20 or 30 barrels I should say?

A I have made my estimate based on the present Brown plan limitation of production.

Q I see?

A And then I say to you that I do not believe any variation in the allowables of as much as 20% would affect my estimate materially.

(Go to Page 915).

Q I see. But your tables actually are based on the present allowable, that is correct is it?

A That is correct.

Q And have you made computations from year to year under the Brown formula to show whether your results acquired were the figures you would have if the production were computed according to that formula. Do you use the Brown formula from year to year to show whether you are right or wrong about this?

A I do not know how to do that.

Q You do not know how to apply the Brown formula, is that the answer?

A Not to the end result that you are wishing me to seek. You asked me if I have . . . . . I wish you would repeat the question.

Q The question is this and I perhaps did not put it very clearly. You have so much oil and so much gas production shown every six months in your tables.

A That is right.

Q Declining production.

A That is right.

Q And you have just told us a few minutes ago that the declining production is based on the assumption that the Brown plan will continue down through 1952, am I correct so far?

A Almost correct.

Q Well how far am I wrong?

A I have made an estimate of what the production will be in each future time. And on the assumption that the Brown plan will remain in effect or will not be modified

materially. The place where you are not completely correct in your question is that the operation of the Brown plan would be only one factor in any case. If the Brown plan were completely forgotten, still the estimate might not be a bad estimate.

Q That is just what I said. Well have you forgotten the Brown plan or not. Or is this based on the Brown plan?

A I have stated I assumed the Brown plan will continue in effect or essentially so and that if it do so, I will have greater confidence in the estimate than I will have if the Brown plan was forgotten, next year or this year.

Q May we say this, that if the Brown plan as at present continues through 1952 that your figures are correct. That is what I want. Based on the formula of the Brown plan.

A In the first place they are not based on the formula of the Brown plan. I have made that clear. As to whether or not my figures are correct, they are an estimate.

Q Can you say whether they accord with the production that will be found if the Brown plan were applied or not?

A No man can claim that an estimate will accord with the ultimate result. He can only express a degree of confidence or lack of confidence in whether or not they will approximate each other.

Q I quite appreciate that. I appreciate your ability

to make a prediction in that way. I am not for one moment questioning your ability to make computations. What I do want to know is this, because I had assumed and I think perhaps everyone here had assumed, that these tables commencing at page 31, I think it is, of your report were the actual production of gas and oil that would occur down through 1952 applying the formula of the Brown plan. That is what my impression was. Now you say it is not so.

A I am surprised that I failed to make it clear that these figures reflect my estimate of what will be produced. But to come here and claim that I could tell you what would actually be produced, I would expect to be disbarred as you legal people say, thrown out.

Q Now can you tell me what pressure you anticipate you will have, average pressure, bottom-hole or top-hole, that you place in 1948 in your table. We will take them one at a time if you like. Can you tell me?

A No, I cannot tell you.

Q You cannot tell me?

A No, Sir.

Q In any single year you cannot tell me what you anticipate your pressure will be?

A Because I have not sought to discover what it might be.

Q No. Well, that is the answer. Do you know what the pressure is at the end of 1952 when you have stopped producing?

A I do not know what it will be.

Q You do not know within any limits what the bottom-hole or the top-hole pressure will be in 1952, is that correct?

A You are speaking of the oil field?

Q I am speaking of the oil area.

A I do not know what the bottom-hole pressure will be.

Q Now I think you have told me of some rate of decline in your gas production, am I right about that, in your table? I think you pointed out yesterday through your counsel how very accurate your prediction was, your estimate and the actual for the last six months of 1944.

A That is right.

Q So you take the same predicted decline in the gas production assuming the Brown plan from six-month's period to six-month's period right down the line to 1952.

A Yes sir.

Q That is correct. Now just turn to page 31. That is estimated future production in the South Turner Valley oil field and that shows your estimate for gas production in the first half of 1944 and then for the last half of 1944 and there was a difference of approximately 1 per cent per month decline.

A The difference between 1722 and 1465.

Q No, I was talking about the six-month period, the 8,263.4 and the 7,790.

A I see.

Q Or you can take it the other way.

A I put it in millions of cubic feet.

Q Yes. Am I right in this because you have had access to the Conservation Board's figures, that the Conservation Board's figures indicate since the Brown Plan went into effect the decline in gas production has been approximately .92 per cent per month. .92 per cent per month.

A Well I cannot confirm your statement. I have studied the reports of the Conservation Board and have made some attempt to analyze their meaning and have reached this conclusion that after the Brown plan became effective, certain wells that had an extraordinarily high gas/oil ratio were limited in their production to such an extent that the average gas/oil ratio was reduced substantially. But that individual wells in the field, many of them, of modest gas/oil ratio were not affected.

Q I was really not speaking of the gas/oil ratio so much as the decline in gas production from month to month, the amount of gas produced from month to month.

A The decline in gas production after the operation of the Brown plan was substantial and it resulted, as I have stated to you, largely through wells of high ratio being accorded a lower allowable.

Q But since the Brown plan you say that has been arrested, that decline?

A Well the facts show that there was prior to the inauguration of the Brown plan a trend upward of the gas/oil ratio of the wells in the field. When the Brown plan came into effect certain wells having been restricted the total average gas/oil ratio

dropped noticeably and after that drop the upward trend again took place and has been consistently upward since that time to the last month that I have had any opportunity to examine.

Q All right. Now then, taking my information - let us assume for a moment that the data, the information contained or assembled by the Conservation Board indicates a drop of production of gas of .92 per cent per month, then you will see that in each of your figures, your first figure which is for the first half of 1944 as against the last half of 1944, the one on which you had actual figures and the other was estimated is practically what the figure of the Conservation Board amounts to, about 1 per cent per month. That shows in each one of yours, practically in each one of your first figures of your table. That is for the first half of 1944 against the estimated last half of 1944 you allowed a decline of about 1 per cent a month. Am I correct in that?

A Apparently that is true. I was not aware of it being that, but it is very satisfactory if it be that.

Q Will the rate of decline in the production of gas, the volume of gas produced, applying the Brown plan, remain a constant factor of percentage decline or will it accelerate down to the time you say you are going to stop producing oil and so on.

A I can only speak to you from the knowledge of the matter that I have assimilated and that knowledge leads me to say to you that the gas/oil ratio of the average oil well in the field is increasing at about a con-

stant rate month after month. The gas/oil ratio. So that so far as I am able to predict, that increase in gas/oil ratio may be expected to continue into the future not at an accelerated rate but at a constant increase. Expressed in quantity of gas rather than a percentage. Now when you apply that increasing ratio of gas to oil to a declining output of oil the result is a constant diminution in the total gas production.

Q A constant diminution?

A A constant diminution, that is right.

Q You are still, of course, producing 25 barrels of reservoir fluid per day per acre?

A That is right.

Q Throughout?

A Yes, Sir.

Q You have that in mind?

A Yes.

Q Your volume of gas produced will gradually diminish as the years go by. That is your answer. The volume of gas produced in those wells.

A I think that is the conclusion.

Q That certainly is what your computations show?

A That is right.

Q Now then, keeping to the volume of gas, will that volume of gas decrease at an accelerated rate or at a more or less constant rate from year to year? Here we have a depreciation we are told of .92 a month decrease in production. Now is that going to continue or is it going to increase?

A Referring to the production as calculated in this table shown on page 31, it would seem to me that the quantity of gas I have predicted will be produced in each year. It is declining at a rather constant rate for at least the first two or three years.

Q Well I just wondered how you got at that, that is all. How do you reach those figures? How do you reach those figures of production of the volume of gas. What are they based on?

A Well, on that page the basis for those figures are shown on page 31. I show the extent and state how I arrived at the estimated production of oil.

(Go to page 923.)

I did explain I believe how I arrived at the estimated production of oil. I did explain that, did I not, how I estimated what the production of oil would be in the first six months of 1945 and what the production would be in the second six months.

Now you will note on that page that I have indicated the gas-oil ratio for the first six months of 5.74 thousand cubic feet per barrel and for the second six months 6.21.

Q Now does that mean you are going to produce less gas?

A Well that is what that study indicates.

Q That is what it indicates?

A Yes.

Q Can you give a reason why it should?

A Well if my gas-oil ratio tends to increase in the future at the rate which it has in the past, if it does so.

Q You will produce less gas?

A If I produce enough less oil.

Q All right. Now then I have just worked out certain percentages on each of these pages and they can be checked, I mean I do not suggest they are right to a decimal point at all, but during your first six months as I see it you have allowed a decline in gas production of approximately, somewhere close to 1% a month or .92 and I find in the next year from the first half of 1944 to the first half of 1945 you have a decline of 13% in the gas produced; that in the following year it is a decline of 16%; that is a decline on

the declining volumes?

A Yes.

Q Superimposed?

A Yes.

Q That in the following year you have a decline of 17%; in the following year a decline of 18%; the following year a decline of 18%; the following year 21%; the following year 20% and the following year 21%; that is in the South Turner Valley field. Now I wondered whether those percentages were worked out in any way on any decline curve basis or anything like that; now may I ask you first before we see the significance of this, I would like to take you to the North Turner Valley field before you look into the point?

A All right.

Q In the North Turner Valley Oil field, which is on page 32, I am going on the average production per month; the decline in gas production from the first half of 1944 to the first half of 1945, that is one year, is 12%; you only had 8% a month in the first six months, but you go to 12% between then and the next year; 19% the next year; 22% the next year; 25% the next year; 26% the next year; 25% the next year; 26% the next year and 33% the last year; what basis is there for that, there seems to be no relation between the one and the other?

A No relation between the North field and the South field, is that what you are pointing to at the moment.

Q No, the rate of decline, I am talking about the rate of

decline.

Q THE CHAIRMAN: There is no relationship between the years?

That is 12% in one year and you get to be 22% in another.

Q MR. BLANCHARD: Which eventually gets to be 33% in the last year and I want to know the reason?

A Well I know of no reason that that percentage decline should remain constant.

Q Why it should remain constant?

A I do not know of any reason.

Q Well why should it not?

A Well if the production of oil in the South field is going to decline in the future in these six months periods at the rate of 15% with compared to the previous six months, the conclusion which I did reach after studying the relation of oil production by the six-month periods, during the two or three recent years that the Brown Plan had been in effect, that if the oil production were to decline at 15% and if the gas-oil ratio was to remain constant, then I would say that the gas production should decline at the same rate as the oil production in the six-month periods or about 30% for the year but in as much as the gas-oil ratio is constantly increasing then the interplay of those percentages would mean that although the oil production may decline at rather a constant percentage relationship, the gas production would decline at an accelerated rate.

Q Can you tell me how much gas in the gas-oil areas at

the end of 1962, recoverable gas, there would be?

A I certainly am not up with that.

Q You cannot tell how much gas there will be in the oil areas?

A Well I do not feel I can, I cannot.

Q Have you any idea what the pressure will be in 1952 when you are abandoning it?

A Well I feel the bottom-hole pressures, I think will be down about something like four or five hundred pounds.

Q Down to four or five hundred pounds?

A I would think probably.

Q And then would there be a migration of gas at that time into the gas cap?

A Well if the pressures in the gas cap are somewhat higher at the time than that, there will be no migration, but with the further passage of time ---

Q Is there any reason?

A Let me answer you?

Q Yes, I beg your pardon?

A With a further passage of time and as gas is removed from the gas cap going down to, let us say, to three hundred pounds, I would expect the gas to move up into the gas cap. That might be in 1960.

Q Now can you produce the wells in the oil areas at a pressure of four hundred pounds, bottom-hole pressure?

A When, --- Your question may be a little more technical than you have in mind.

Q Possibly?

A And I was taking your meaning a moment ago, when you asked me what I thought the pressures in the oil fields

would be, the bottom-hole pressures in 1952, I was taking it to be your meaning, what will the average settled bottom-hole pressures be. Now you asked me, can you produce oil with a bottom-hole pressure of four hundred pounds; well when the average pressure has gone down to four hundred pounds then the operating pressure if the wells are being operated would be something well under four hundred pounds.

Q Yes?

A I presume two hundred and fifty pounds, I do not know just what. I can conceive that to be about the limit of practical operation in the field.

Q Would not a great many of those wells have become gas wells?

A They would be gas wells subject to the occasional unloading of fluid which would collect in the well hole and if it could be an operation in which the oil would be, the well would be equipped so that oil could occasionally be taken out of the well, permitting the gas to flow until such time as it again became plugged up with oil.

Q I suppose what it really amounts to is this, Mr. Davis, is that by 1952 by reason of low oil production that it will not be economical for an oil producer to produce his well at all?

A Well that is my thought.

Q But there may be a lot of gas there at a pressure which can produce it, apart from the oil?

A Well there will be a lot of gas in that area.

Q Yes.

A In that formation.

Q Yes, and probably pressures at which it can be produced?

A Well the problem then will be, and I do not profess to know what will happen, it will be a problem whether or not they can keep the well cleaned out sufficiently to make the gas recovery, plus any oil recovery, pay for the job. It may be that that will continue for sometime after 1952.

Q Do you anticipate, let me ask you this, do you anticipate at the end of 1952 that these wells will be flowing on the average, not all of them but on the average?

A I doubt it. I doubt it.

Q What would be the effect of increasing very substantially the Brown Allowable in 1952, what effect do you think that would have on the industry then, that is at the end of your term, suddenly increasing the Brown Allowable to let us say 40 barrels per acre a day, would you anticipate that that would encourage the oil producers to continue to produce their wells?

A I rather think, Sir, that the wells will be in a shape where encouragement will not result in an increased production.

Q It will not be an incentive?

A I do not believe they will produce enough oil, regardless of the allowable.

MR. BLANCHARD: All right, I think that is all.

THE CHAIRMAN: Anything, Mr. Steer?

RE-EXAMINATION BY MR. STEER

Q I am not sure, Mr. Davis, whether you made it quite clear what your view is with regard to the possibility of these wells being operated economically, the crude

oil wells being operated economically, when their pressure has declined below four or five hundred pounds?

A Well I have tried to make that clear. I am aware that there are wells in the field that have declined in their oil production to less than 25 barrels per day, some down to ten or twelve barrels a day, and having been an oil producer myself, - not in Turner Valley, - I know how the day comes when wells do not pay the cost of producing them and I doubt that any money could be made out of Turner Valley wells at the present price of oil when the production gets down to ten barrels a day.

Now you ask me what I think about their economic limit. I think that at the present price of oil that the economic limit is not lower than ten barrels a day average. I think if a company has 25 wells and 21 of them are producing 30 barrels a day and four of them are producing seven barrels they might keep the seven on because they keep the same organization busy anyway but if all 30 wells were producing ten barrels a day, I do not believe they would operate very long.

Q In other words it might, in your view, be profitable to produce below ten barrels of oil a day from a well but in your view it would not be a financial, it would not be financially advisable for a person to go ahead and do it?

A Well I am not talking about a company that owns three or four wells that have gone under that limit. I think they might be doing the right thing to keep the wells producing because they have the same crew of men and their cost

would not be reduced as four into thirty by dropping four wells, they might reduce their cost as of one-third by dropping those four wells, and therefore it might be better to keep the four wells on for awhile but I am trying to make it clear that when the average well or when all wells are down to about ten barrels, I do not believe the operation will be returning a profit to the owner. That is what I call the economic limit.

Q DR. BOOMER: Mr. Davis, going back to your figures on page 45 of your report, I am curious about the effect upon the position of these left-hand curves of the probable errors in the cumulative production figures which you used; for instance I believe Mr. Beach testified that there might be 45 billion feet error in the cumulative production of 1931, assuming that as the minimum error, and suppose that the negative error, that is the cumulative production is greater than that by at least that, will that have any appreciable effect on your estimate of 300 billion?

A My estimate ignores any production figures prior to 1931, that is tosay whether the total production to 1931 had been 206 billion feet- indicated on this graph, or whether it had been 600, has no influence on the estimate which I arrived at because I make no use of those figures back in 1931.

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Q Your accumulative production is from 1931 ?

A No it is from the beginning, but inasmuch as arriving at my judgment I use only the latter part of my graph data, it matters not what the errors may be in the early part.

Q You told me that those errors will not change the slope of that graph ?

A The slope - I told you that the slope of the graph from the beginning up to the year 1931, about the end of March 1931, when the pressure as recorded was slightly over 1200 pounds. That time the reported production was 260 billion cubic feet. Now if we knew right now that the actual production at that time was 500 billion, we would simply break that point on the graph and move it over until it was on the vertical line above the 500, about two and a half of the major spaces of my sheet and starting from there the graph would come down the page in parallel position to its present position, and I would simply show at the end of June 1944 about 250 billion greater accumulated production and 250 billion greater ultimate reserve.

Incidentally, Dr. Boomer, I have a graph that I would like to show you and if you want copies for this case I would be glad to give it to you. This is a graphic report of the production of gas in the Monroe field in Louisiana showing relation of production to weighted average pressures. I bring it to you because it indicates what such a graph should look like if there be no factors of uncertainty, and I am not even

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positive that there may not be factors of uncertainty in that study, but it comes the nearest to a pure relationship that I know of.

Q Referring to that Monroe field, it is true today that most of the gas from that field goes to the fuel market rather than the carbon products ?

A Yes, probably less than five percent today to the carbon people. In 1924 it was about 95 percent of the carbon market and five to other markets. Today those figures are completely reversed.

Q In that field there is extensive gathering systems and compressing stations ?

A Yes.

Q They have to raise the gas to transmit more pressure before they can market it ?

A Well the gas is produced and gathered by several producing companies and those companies now have compressor stations. The buying companies with pipe lines reach from the field to distant markets. They all have compressor stations right within the field so at the point where the gas is sold it is compressed. It pours into the low side of the compressor station of the buyer at the point of sale.

Q What is the average weighted pressure in the Munro field now ?

A In April 1943 it was about 460 pounds, and December 1943, at that date I knew what the additional production had been and from it was able to estimate the pressure was down to about 440 pounds. With another year's production that pressure must be down

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now to about 410 pounds.

Q How far do you think they will carry ?

A For production of gas in quantities sufficient to be of importance to the major pipe lines now taking the gas I think this graph shows that my estimate goes to 200 pounds. When they have reached 200 pounds as the weighted average top of well pressure, then the pressure in the gathering lines will have to be down to 100 pounds or less at the station, probably something less than that, 60 pounds maybe, and it just will not gather enough gas to feed those big lines to any appreciable extent but even after that I believe the Monroe field will afford a supply of gas for local cities such as Monroe, Bastrop ., for another 100 years.

Q I understood you to say that you could not assess the value of repressuring to the recovery of oil. Am I right in that understanding ? In the particular case of Turner Valley.

A In the particular case of Turner Valley I say that I do not have an opinion as to the extent of good that might accrue in repressuring at this stage of the game. I did also state this that had the pressure in the gas cap been maintained, had the early production been from oil wells and the oil field operated as an oil well first and when it finally was exhausted then the gas cap gas started to its market, then in my opinion the oil field would have produced a vastly greater amount of oil than it will under the circumstances that have prevailed.

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Q Is there any risk of not being able to reproduce the gas that has been repressured in Turner Valley ?

A I would consider that risk very slight indeed. I think the gas put back into the reservoir will be there and available. I think this would be a proper view, that if you commingle 50 billion feet of gas - let me restate that - with a reserve of 500 billion and then recover from the combined totals 350, it is fair to consider that the remaining unrecovered gas includes some of the gas that was stored and possibly in the proportions of storage gas to total gas in the reservoir. That is to say gas put into the reservoir, we cannot say that all put down will come back and that all of the final remaining pressure will be that which is there now.

Q You are saying that a portion of the unrecovered gas will be repressured gas ?

A Oh I think so.

Q You do not know of any way of identifying repressured gas ? (No answer)

MR. STEER: I have had it suggested to me you might odorize it in putting it in.

DR. BOOMER: Now a question about the Brown Plan. Have you ever read it ?

A Yes.

Q Is it for the conservation of oil or for oil and gas ?

A Well I believe it is for the conservation of oil and gas.

Q Do you know that the effect of the Brown Plan on Turner Valley received a study last year ?

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A I did not know that.

Q You have not seen the report of the results of that study ?

A No sir.

Q I think you will agree with it ?

A I should like to see it.

THE CHAIRMAN: Mr. McDonald ?

MR. McDONALD: No sir, Dr. Boomer covered the point.

THE CHAIRMAN: Do you feel, Mr. Davis, that you cannot place any value to the oil industry by repressuring which is proposed to be done under this scheme. I think that is the effect of your answer, is it not ?

A My judgment is that distinguishing the oil industry between the oil production and the gas that the oil producer is going to sell under this scheme will result in the oil producer selling some gas that of course is a benefit.

Q To that extent ?

A To that extent I see a benefit. Beyond that I think there may be benefits, but I am not able to measure it and I do not believe it is great. I believe it is nominal.

Q But it must be quite true that the absorption plant will benefit by this particular operation that is now going on ?

A Absolutely.

Q To the extent that the now recoverable reserves containing natural gasoline ?

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A To the extent that they will make a profit out of an increased supply of gas containing gasoline.

Q Is there any way to evaluate that benefit to the absorption company ?

A Yes I would think so.

Q Could you do it ?

A Well I would expect that I could.

MR. HARVIE: I missed that answer.

THE CHAIRMAN: He thinks that he could.

Q It is quite clear that the City of Calgary will benefit to the extent that they are going to get natural gas for a great many years than they would have got but for the institution of the Brown Plan ?

A I have recognized that the increased life of the field is a benefit to the City, to the consumers of gas, to the extent that the gas is you might say dedicated to the City. They became a beneficiary in 1935. If the gas be restored to the reservoir and open for sale to anybody who comes, I would doubt that the City could be said to have benefited until we see the results. That is to say, if somebody comes in and buys this restored gas and takes it away from the City its accepted prolongation of supply, then it will have none. When that happens that the City really did not benefit.

DR. BOOMER: Would you not say it would be all right if the purchaser paid for it ?

A If the purchaser sir of that gas paid for it, I think he will pay for it or he won't get it. In my judgment.

Q That would relieve the City ?

A I think if the City were for example to pay something

in 1945 or 1946 for a benefit to accrue to it in 1956 or 60 and then in 1956 or 60, found that the benefits paid for never is coming I do not know what you would do about that. I lean to the view that the fellow should pay for it who uses it when he uses it. That is my view.

Q What would be the elements in the price ?

A I am hardly prepared to go into that today.

THE CHAIRMAN: Supposing this plan that is now in force had been put in force ten years ago, would it have cost as much then as it is costing now ?

DR. BOOMER: About seven years ago.

A In the first place I feel sure it would have cost considerably less to have put in the equipment. That is the one thing but it would on the other hand -

THE CHAIRMAN: You would not have needed as many compressors as you do now ?

A Well the compressors needed would be the compressors needed to reach out and take the peak gas over and above that with which the market will absorb in July and that might have been the same number of compressors but the compressors would have cost less money seven years ago, pipe lines less money.

Q And by this time half the investment would have been written off ?

A Well the whole investment could have been written off over let us say about twice as much gas conserved.

Q That is the point. It would have been a better thing to have done seven years ago than to be doing now. Would it be a fair thing to charge those people who

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failed to do those things with the approximate present day cost or should it all be charged to the City of Calgary ?

A Well I would say that the people who are responsible for gas wastage and who now may benefit from this conservation are the ones to be loaded with costs to the extent that that is possible.

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THE CHAIRMAN: I may not have expressed it very clearly but you have answered the question that I was struggling with, Mr. Davis. Anything further?

MR. CHAMBERS: Mr. Chairman, I have one question.

Q Mr. Davis, is it not true that the Royalite absorption plant would have had the same connected supply whether this system of conservation had been put in or not?

A Well I wish to answer the question - when we are talking about this system, I do not know whether you mean this system of conservation as recently ordered by this Board?

Q Yes?

A You mean to say that the Royalite plant would have had the same gas throughout connected to it after Royalite decided to make certain extensions in the field within the last year and a half?

Q Yes?

A Now you ask me would it not have the same connected gas delivery as it will have under this system?

Q Yes? Substantially, wet gas I am talking about?

A Well would it be getting the G.O.P. gas?

Q It is not getting G.O.P. wet gas now, I mean, under this system, as I understand it.

A Well, the G.O.P. gas comes over to you.

Q I am talking about the absorption plant, about the wet gas?

A Oh, you are talking about the wet gas.

Q Yes?

A Not dry gas?

Q No?

A So far as the wet gas is concerned I believe the answer to your question is "Yes".

Q Now if this system or if this present scheme of conservation had been introduced seven or eight years ago, I think you said in answer to the Chairman that the cost would have been much less, was I right about that?

A Yes, I think that is correct.

Q My instructions are that if it had been put in seven or eight years ago, Mr.Davis, it would have roughly 150 million cubic feet a day of crude gas to handle. Now, I am suggesting to you that the cost of the compressor plant that you would have required at that time would have made the cost more than it is today?

A See if you are telling me the straight of it. The present daily production in Turner Valley is what, 26,000 barrels?

Q No, about 20 I think it is?

A 20.

Q Yes, 20 or 22, thereabouts?

A And six or seven years ago what was it?

Q About 26 my instructions are.

A It was 26 then and now it is 20, and the average gas-oil ratio then as compared to today, was it roughly the same?

Q My instructions are that the gas-oil ratio today is probably a little higher.

A A little higher?

Q Yes.

A I would take it that there was not any substantially greater amount of gas from the oil field areas to gather seven years ago than today.

THE CHAIRMAN: I do not think those figures are right, Mr. Chambers.

DR. BOOMER: In 1938 there was 21 billion 811 million, 21.8 billion.

WITNESS: 21.8, and what is it today?

MR.BLANCHARD: It is given on page 15 of the 1942 report. I don't know what exhibit it is. Exhibit 28.

DR. BOOMER: In the year 1944 it is 29 billion in the oil area.

WITNESS: 29 and in '38 it was how much?

THE CHAIRMAN: 21.

A 21. That is not what it was as it was given to me.

MR. STEER: I think there might be a mutual exchange of questions to settle the issue.

A WITNESS: Well, anyway, Mr. Chambers, it looks as though they might have required about as many compressors then as now, and the cost might have been substantially less. They tell me something about building pipe lines here, $19,000.00 a mile, ten inch lines or eight inch lines, I don't know which they were. I guess it did not make much difference what size they were.

Q MR. CHAMBERS: And then in the meantime whatever was spent somebody would be paying a rate of return on it?

A We hope.

Q But my instructions are that in 1941 you had 35 billion,

780 million from the oil wells and in '44 you had 30 billion, 589 million, so that while seven or eight years ago your initial installation would not have been the maximum that you would have installed, you would have had to instal additional capacity in 1940 or 1941.

A Yes, to reach up and get the last cubic foot of gas. I have not indicated that it would be my judgment that it is sound engineering or economic or business to put in compressors to reach the peak quantity available for a single year or for two years. I have gone along on a period that quantity of gas to be handled by that last horsepower should be enough to justify that last horsepower, and so if we put in compressors to handle 30 billion a year, they would have been sensible within my range of thought to let some of the gas go into the air because it would not be of sufficient value to pay for the cost of conserving it.

Q That is contemplated under the present plan?

A Well, all right. In any case, have it whichever way you want it, whether they are going to put in enough compressors to take care of 35 billion, if you want to go after the peak, or put in to take care of 30 or 31. My view would be to take care of the gas that would come somewhere near paying its way.

Q Mr.Davis, my understanding is that it is not an uncommon practice in the States that gas companies supplying cities or urban centres consistently carry as part of their rate base or part of their expenditures, which is added into the consumers' rate, costs for keeping

the gas reserves available, undeveloped fields.

In other words, it is common through the soncumers' rate to pay something to insure a supply of gas a number of years ahead?

A Yes, and I have always been an advocate of that scheme.

Q And as a matter of fact here back in '26 or thereabouts, or even '21, anyway my recollection is or my understanding is that there was then included in the rate base of the Calgary Gas Company a substantial amount of money for new development. Do you recall that?

A I think that resulted in the rate hearing held in 1931, and I think that the company was given approval of an expenditure of $100.000.00 a year in the search for gas, and the reason that plea was made, - I made the plea myself, - that the company should be permitted to spend money to find gas, and for the reason that its principal supply, Turner Valley, was being blown through the air, at the rate of four or five million feet a day, and we had better get busy and find some more gas.

Q And you will admit with me, Mr.Davis, that the history of the Gas Company, that is in the early days in '21 to '24, the Gas Company included in its budget and in its rate base, considerably more for exploration and development than it did after they got the Turner Valley supply.

A I do not know that because I was not associated here prior to 1925, but I would not doubt that what you are telling me now is history.

Q My instructions are that it was either in the 1921 or '26 rate base hearing that there was an amount of $60,000.00 or $70,000.00 included in that. You have no knowledge of that?

A No, I never heard of that.

Q All right, thanks, Mr.Davis.

.....

CROSS-EXAMINATION BY MR. McDONALD.

Q Mr.Davis, in this conservation of 1937 you are familiar with the fact that there was an exclusive contract between the Gas Company and the Royalite Company in 1927 which prevented the sale of the gas by anyone who did not intend to deal with the Royalite Company?

A Yes. That contract went back, however, to 1925, as I recall it. It was the contract that was in existence during all the years from 1924 on up, and is in effect right now, I believe.

Q Now if anything is being conserved, it does not matter what it is, it must have a value, it must have some value to it before there is any incentive to conserve it at all, is that not so?

A Yes. I think that it is human nature to let things go by the board if they are not worth anything to you. That is, as a general thing.

Q So that as far as your knowledge is concerned, there is only one purchaser of gas?

A Yes.

Q That is right?

A Yes.

Q The question of the export of gas is a matter of Government policy, you will agree with me. I am just telling you that. The question of the export of gas in the Province of Alberta is a question of Government policy.

A You are telling me that the Government does not believe in exportation?

Q No. I am saying that the question of export is a question of the Government's policy, the moving of the natural resources from the Province outside of the boundaries of the state is a question of permit?

A I know what you have to get. You have to get permits either to export gas or import gas, as far as I know.

Q So that if in the Province of Alberta there was no market which was not controlled by the Calgary Gas Company of a substantial size?

MR. STEER: Controlled by what?

Q MR. McDONALD: By The Calgary Gas Company or The Canadian Western of a substantial size, and the only market to be found would be outside of the limits of the Province of Alberta, the vendors of gas not interested in selling to the Royalite Company would have to sell their gas outside of the Province in substantial quantities. You agree with me that far?

A You are saying to me that there was no market available to the independent producer in Turner Valley, from 1924 to 1943 or something like that?

Q Yes, unless he export his gas outside of the Province?

A Unless he made efforts to have some industry brought in to use the gas.

Q Yes, that is right?

A And there was no existing industry or city within the Province.

Q Yes. So that the only party who was really interested in conserving gas in 1937 would be somebody who wanted to purchase that gas or had a future use for it?

A Unless you had something for it in the future.

THE CHAIRMAN: You open up a tremendous field there, Mr. McDonald.

MR. McDONALD: I think your question did. I do not know whether you intended it to.

THE CHAIRMAN: I think you can take that up under another heading, but you are opening up the field so wide it is not fair to ask the witness the questions you have asked him.

MR. McDonald: But, Sir, I took it from your questions that it was the fault of the producers in Turner Valley that this gas was not being conserved in 1937.

THE CHAIRMAN: I never mentioned the producers.

MR. McDONALD: I do not think the question bore any other inference. If that was not the inference that you place on it, I have no wish to pursue it, but I do maintain and I think that it should be dealt with now.

THE CHAIRMAN: Well, Mr. McDonald, I am not going to let you ask the witness any more questions along that line. However, you can ask him the questions but if he does not want to answer them he does not have to.

MR. McDONALD: I am quite content if that was not the inference of the Chairman's questions that the

producer is the person who is responsible.

THE CHAIRMAN: Mr. McDonald, the question is there and you can drew whatever inference you wish, and it is your privilege.

MR. McDONALD: And I can lead evidence with regard to it?

THE CHAIRMAN: Yes, when you wish under the proper heading.

MR. McDONALD: All right.

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MR. McDONALD: Might I ask this, though, is this witness going to be in the box again?

THE CHAIRMAN: I have not the faintest idea.

MR. STEER: I am inclined to think he will.

THE CHAIRMAN: Thank you very much, Mr. Davis.

STANLEY J. DAVIES, having been duly sworn, examined by Mr. Fenerty, testified as follows:-

MR. FENERTY: If the Commission pleases and perhaps to answer a question that Mr. Harvie may ask, I may say that Mr. Davies has been retained in an advisory capacity by the City of Calgary and his evidence will be made available to whoever wants to consider it.

Q Mr. Davies, what is your occupation?

A Petroleum engineer.

Q How long have you pursued that occupation?

A Since 1921.

Q Now what are your qualifications for that particular work?

A I am an Associate of the Royal School of Mines, Petroleum and Oil, London, England; a member of the Mining Engineering Institute of Canada and a registered professional engineer in the province of Alberta in Mining.

Q I believe you have been associated with oil operations and geological work in Turner Valley for a very long time?

A Yes, sir. I first came to Turner Valley in 1914 with the Geological Survey, working under Mr. Slipper

or with Mr. Slipper. Then due to the war of 1914-1918 there was a lapse and I was in several other countries of the world in the oil industry after the last war until the year 1924 when I returned to Alberta. In 1925 I was Petroleum Engineer with the Dominion Government and then in 1926 I started a Consulting business which continued until 1940 and I now have another four-year gap due to the present war.

Q During this period you have been engaged in geological work in the Turner Valley areas as well as engineering?

A Yes sir. Perhaps more engineering work than geological work but I took both phases of the industry and had something to do with the development of both the geological side and the engineering side.

Q And at intervals, you have been called upon to make intensive studies for the purpose of giving evidence before these Commissions having to do with Turner Valley?

A Yes. I appeared first in 1926 before the Public Utilities' Board and again in 1931, in both cases for the City of Calgary. Then in 1938, appearing for the Royalite Company before the McGillivray Commission.

Q I believe that you have actual knowledge of the operations of some individual oil companies by reason of your connection with them.

A Yes sir. I am interested in and manager of some very small now gas cap wells.

Q And to a certain extent you have some knowledge

of the gas operations involving the marketing of gas in the Valley?

A Sir, I do not wish to elaborate on this. As the Chairman well knows, I am the manager of the Valley Gas Company which appears as one of the consumers.

Q You understand some of these things we all know but they are supposed to be a matter of record for this Inquiry.

THE CHAIRMAN: Sometimes you wish you were not.

A Quite correct, sir.

Q MR. FENERTY: With a view to having these matters on record, I think I would like to ask you just a few questions about the history of the Valley, which I think is bound up in the matter of reserves and production. You say you have been associated with that work since 1914.

A I first worked in Turner Valley in 1914, the summer of 1914.

Q I believe you know something of how the Valley was developed?

A Yes sir.

Q The drilling program and so on?

A Yes, sir.

Q As a result of that knowledge can you tell me the purpose of the drilling of the wells in the Valley field?

A In 1924 the Royalite company drilled or completed Royalite No. 4 as the first well in the limestone. Up until that date all production had been secured

from upper horizons and nothing had been known of the production in the porous limestone. Dr. Hopkins, I believe, the Chief Geologist of the Imperial Oil, was one of the main movers in testing the deeper horizons, the lower horizons. Following the year 1924, we had a number of wells drilled some of which were stock promotions and associated with the various oil booms that we have had in this Province and as they are quite a part of the development in the Valley, I believe they have some importance. Wells were started on, in some places, very small acreage and drilling throughout the field in the gas cap particularly, because that was the only portion known to be productive. We had Royalite developing gas on the one hand, a part of which was sold to the market, but many other wells were drilled for the production of naphtha and practically all of the independent wells, independent company wells, were drilled for the development or sale of naphtha. Because, as Mr. McDonald has pointed out, they had no interest in the sale of natural gas at all. Starting at the South end of the field in the gas cap area, the Highwood wells of which there were two, all of section 28, section 33 which was Sterling Pacific wells; Mercury in section 4; Southern Lowry and Commonwealth wells in section 9; South West Petroleum and the Mayland Company, all the Home, Calmont, Wellington, Hargal wells in section 20; East Crest wells in section 16; Lowry Petroleums in section 17 and the A.P.Con wells that were all drilled having no relation to the sale of

gas at all. They were all independent companies when they started and were drilled for naphtha which they might secure. Then we have the Dalhousie Company which was a subsidiary but for long years sold little or no gas to the gas company, as Royalite purchased gas occasionally from the Dalhousie but not often. Coming further North we have the Okalta well, the Macleod well, McDougall-Segur and British Dominion, Spooner, Vulcan and another group of wells in the central portion of the field, all of which were again drilled for the production of naphtha and not for the sale of gas. Of the total wells drilled, some 27 wells belonged to Royalite in the gas cap of which 1, 2 and 3 were never drilled to the limestone at all. Royalite 4 was drilled to the limestone, as I mentioned in the beginning of this limestone. It was abandoned some 5 years after 1924. Royalite No. 5, 15 and 16 have been abandoned. No. 5 was never completed. We therefore have some 27 Royalite wells in the gas cap, of which 20 alone are remaining as producers, some small and some greater. In the gas cap as a whole, there are some 96 wells. There were more. Twenty-odd wells have been abandoned in the gas cap. I want to point out that they were abandoned not because they did not have the pressure but because they did not have the revenue. They became smaller and smaller and smaller and were finally abandoned, although that acreage on which they were drilled still forms part of the acreage which has been mentioned here as the gas cap area and over which weighted pressure

had been taken. I think that covers that point.

Q Now coming back to the later development in what we call the crude oil field, after crude oil was discovered, what have you to say as to the purposes of that group of wells, the drilling of those wells.

A The Turner Valley Royalties well was drilled in section 28 and it was what might be termed the first major discovery of crude oil in Turner Valley by Mr. Bob Brown. There had been and I regret very much to say that I did not have the brains enough to interpret the facts correctly - but there had been evidences of crude oil production at a much earlier date than 1936. We had three wells which turned from naphtha production to crude oil and that indication then led to the drilling of other wells further West, on the West side. From 1936 on all of the wells drilled, some 260 wells drilled, were drilled for the purposes of producing crude oil.

Q Yes. Now just again for the purpose of having on record something that may be more or less elementary, would you just tell us what the method of operation of a crude well in Turner Valley is.

A Crude wells in Turner Valley flow and this has been - this document was in as . . . .

Q If you will give us the process first.

A Oil is elevated to the surface by the expansion of the natural gas in the formation. They are not pumped in other words.

Q You have a gas lift, is that it?

A Yes, you have an automatic gas lift, a natural gas lift.

Q That results in the production of a certain volume of oil and gas, which are separated in the separators at the well site?

A Yes sir.

Q On the one hand you get crude oil and on the other hand you get wet gas.

A Correct, sir.

Q And that in the normal process, if there are facilities, that wet gas is then processed in the absorption plant?

A That is correct.

Q Resulting in the recovery of a certain volume of natural gasoline?

A Correct.

Q And downstream from the absorption plant, a diminishing volume to some extent of what we call dry gas, in the sense that it is drier than it was before it went into the absorption plant?

A That is correct.

Q And that dry gas, where there has been a market for it, in Turner Valley, has been used for that market, such as heating and so on and otherwise has been flared?

A That is correct.

Q That is roughly the process that we had?

A Yes.

(At this stage the Hearing was adjourned until 9.30 A.M. 21st March, 1945.